

Student Name:

Date:

MOTION IN TWO DIMENSIONS

I. Multiple Choice Questions

Select and write one most appropriate option out of the four options given for each of the questions 1-5.

1. In a projectile motion, velocity at maximum height is

(a) $\frac{u \cos \theta}{2}$

(b) $u \cos \theta$

(c) $\frac{u \sin \theta}{2}$

(d) None of these.

2. A projectile is fired at 30° to the horizontal. The vertical component of its velocity is 80 ms^{-1} . Its time of flight is T . What will be the velocity of the projectile at $t = T/2$

(a) 80 ms^{-1}

(b) $80\sqrt{3} \text{ ms}^{-1}$

(c) $(80\sqrt{3}) \text{ ms}^{-1}$

(d) 40 ms^{-1}

3. The path followed by a body projected along y -axis is given as by $y = \sqrt{3}x - (1/2)x^2$, if $g = 10 \text{ m/s}$, then the initial velocity of projectile will be - (x and y are in m)

(a) $3\sqrt{10} \text{ m/s}$

(b) $2\sqrt{10} \text{ m/s}$

(c) $10\sqrt{3} \text{ m/s}$

(d) $10\sqrt{2} \text{ m/s}$

4. A body of mass 2 kg has an initial velocity of 3 m/s along OE and it is subjected to a force of 4 Newton's in OF direction perpendicular to OE . The distance of the body from O after 4 seconds will be
- (a) 12 m (b) 28 m
(c) 20 m (d) 48 m
5. Two seconds after projection a projectile is travelling in a direction inclined at 30° to the horizontal after one more sec, it is travelling horizontally, the magnitude and direction of its velocity are
- (a) $2\sqrt{20}$ m/s, 60° (b) $20\sqrt{3}$ m/s, 60°
(c) $6\sqrt{40}$ m/s, 30° (d) $40\sqrt{6}$ m/s, 30°

II. Fill in the Blanks Type Questions

Fill in the blanks with a suitable word for each of the questions 6–10.

6. In the entire path of a projectile, the quantity that remains unchanged is _____ .
7. Among the following, the vector quantity is _____ .
8. If the velocity (in m s^{-1}) of a particle is given by $4.0\hat{i} + 5.0t\hat{j}$, then the magnitude of its acceleration (in m s^{-2}) is _____ .
9. The horizontal range of a projectile is maximum when the angle of projection is _____ .
10. The graph between displacement and time for a particle moving with uniform acceleration is a _____ .

III. True or False

State whether the following statements are true or false for each of the questions 11–15.

11. All those quantities which can be measured are known as physical quantities.
12. Physical quantities which have only magnitude and no direction are scalar quantities.
13. Vector quantities are those physical quantities which have both magnitude and direction and obey the laws of vector addition.
14. Unit vector of a given vector is a vector of unit magnitude and has the same direction as that of the given vector.

- 15.** A vector is said to be negative of a given vector if its magnitude is not the same as that of the given vector but direction is reversed.

IV. Very Short Answer Type Questions

Answer each of the questions 16–20.

- 16.** Name a quantity which remains unchanged during the flight of an oblique projectile.

- 17.** Name five physical quantities which change during the motion of an oblique projectile.

- 18.** Name two quantities which would be reduced if air resistance is taken into account in the study of motion of oblique projectile.

- 19.** The maximum horizontal range of a cannon is 4 km. What is the muzzle velocity of the shell, if $g = 10 \text{ m s}^{-2}$?

20. Why does a tennis ball bounce higher on hills than in plains?

V. Short Answer Type Questions

Answer each of the questions 21–25.

21. A ball is thrown horizontally and at the same time another ball is dropped from the top of a tower. (i) Will both the balls hit the ground with the same velocity? (ii) Will both the balls reach the ground at the same time?

22. A motorboat is racing towards north at 25 km h^{-1} and the water current in that region is 10 km h^{-1} in the direction of 60° east of south. Find the resultant velocity of the boat.

- 23.** Two vectors acting in opposite directions have a resultant of 10 units. If they act at right angles to each other, the resultant is 50 units. Calculate the magnitudes of the two vectors.

- 24.** What is the effect of air resistance on the time of flight and horizontal range of the projectile?

- 25.** A projectile of mass m is projected with velocity v at an angle α with the horizontal. What is the magnitude of the change in momentum of the projectile after time t ?

Teacher's Signature